

until the 11th, then a group a little west of sun's meridian, and another one day from east edge. The largest spot, estimated at 31,400 miles in diameter, disappeared by solar rotation on the 16th, but failed to reappear on east edge. The other spot, estimated at 22,009 miles in diameter, disappeared by solar rotation on the 22d. Two other large spots on the east edge on the 27th.

Mr. H. D. Gowey, North Lewisburgh, Champaign Co., Ohio: sun spots were observed from the 11th to the 17th, and from the 20th to the 22d.

Mr. M. A. Veeder, Lyons, Wayne Co., N. Y.: 3d, much faculae, followed by a large spot, came into view upon the sun; 17th, large spot and several smaller ones appeared; 26th, extensive disturbance, followed by spots, appeared.

## VERIFICATIONS.

### INDICATIONS FOR 24 HOURS IN ADVANCE.

The percentages of verifications of the 8 p. m. daily indications for November, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for November, 1888, were made by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.

*Percentages of indications verified, November, 1888.*

States.		States.	
Maine.....	84.4	Tennessee.....	84.9
New Hampshire.....	88.7	Kentucky.....	79.6
Vermont.....	80.3	Ohio.....	79.9
Massachusetts.....	82.2	West Virginia.....	80.9
Rhode Island.....	85.8	Indiana.....	77.3
Connecticut.....	83.1	Illinois.....	83.8
Eastern New York.....	78.8	Lower Michigan.....	83.2
Western New York.....	76.9	Upper Michigan.....	84.3
Eastern Pennsylvania.....	83.4	Wisconsin.....	88.1
Western Pennsylvania.....	81.3	Minnesota.....	85.3
New Jersey.....	81.5	Iowa.....	83.3
Delaware.....	84.9	Kansas.....	86.0
Maryland.....	84.7	Nebraska.....	89.9
District of Columbia.....	86.5	Missouri.....	83.9
Virginia.....	87.1	Colorado.....	85.5
North Carolina.....	88.8	Dakota.....	87.7
South Carolina.....	88.8	Southern California*.....	89.3
Georgia.....	84.5	Northern California*.....	88.9
Eastern Florida.....	86.1	Oregon*.....	78.9
Western Florida.....	80.6	Washington Territory*.....	78.0
Alabama.....	86.7	By elements: Weather.....	85.6
Mississippi.....	87.6	Temperature.....	82.2
Louisiana.....	90.1	Monthly percentage of weather and	
Texas.....	86.7	temperature combined †.....	84.2
Arkansas.....	83.1		

\* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and tem-

perature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

### CAUTIONARY SIGNALS FOR NOVEMBER, 1888.

Statement showing percentages of justifications of wind signals and cold-wave signals for the month of November, 1888:

*Wind signals.*—Total number of signals ordered, one hundred and forty-three; justified as to velocity, wholly, ninety-four, partly ten; justified as to direction, one hundred and twenty. Of the signals ordered, one hundred and fifteen were cautionary, of which seventy were wholly, and eight partly, justified; twenty-eight were storm, of which twenty-four were wholly, and two partly, justified. Seventy-five were ordered for easterly winds, of which fifty-seven were justified; sixty-eight were ordered for westerly winds, of which sixty-three were justified. Number of winds without signals, twenty-six. Number of signals ordered late, thirteen. Percentage of justifications, 68.2.

*Cold-wave signals.*—Total number of signals ordered, one hundred and eighty-five; number wholly justified, one hundred and twenty-one, of which six were ordered late. Number partly justified, two. Number of severe cold waves without signals, thirteen. Percentage of justifications, 63.2.

*Percentages of local verifications of the weather and temperature signals, as reported by the directors of the various State Weather Services for November, 1888.*

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois.....	89.0	91.0	Nebraska.....	89.8	92.6
Indiana.....	89.1	85.1	New York.....	87.0	84.0
Kansas.....	80.4	84.9	Ohio.....	82.0	81.0
Louisiana (northern).....	88.0	96.0	Tennessee.....	89.8	91.6
Louisiana (southern).....	92.0	84.0	Texas.....	78.7	87.2
Michigan.....	82.9	77.6			

## STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts are republished from reports for November, 1888, of the directors of the various state weather services:

### ALABAMA.

November has been unusually mild, both in the condition of the weather and the range of temperature. It was not until the month was half gone that the first heavy frost occurred. Twenty days were fair and pleasant—favorable for all farming operations.

The frosts that occurred toward the close, although heavy, killed only the delicate plants. The fall has been unusually late. The average temperature was 1° 7 above the normal. There were three periods in which precipitation occurred. The first was the 8th and 9th; the second, 14th and 15th; and the third was the 19th. The average rainfall was 0.61 below the normal.

#### Summary.

*Temperature.*—Monthly mean, 58.6; highest monthly mean, 59.4, at Mobile; lowest, 47, at New Market; maximum, 82.7, at Mobile, 3d; minimum, 20, at Valley Head, 28th; range for state, 62.7; greatest local monthly range, 57, at Valley Head; least local monthly range, 43, at Edwardsville.

*Precipitation.*—Average for the state, 3.69; greatest, 6.56, at Gadsden; least, 1.83, at Motes.

*Wind.*—Prevailing direction, north.—P. H. Mell, Signal Corps, Auburn, director.

### ARKANSAS.

#### Summary.

*Temperature.*—Monthly mean, 49.9; highest monthly mean, 55.8, at For-

rest City; lowest monthly mean, 45.5, at Ozone; maximum, 87, at Lead Hill, 1st; minimum, 21, at Dayton, 28th; range for state, 66; greatest local monthly range, 62, at Lead Hill; least local monthly range, 37, at Dallas, and Prescott.

*Precipitation.*—Average for the state, 5.03; greatest, 9.65, at Lonoke; least, 0.31, at Prescott. Snow fell at Fort Smith, Dallas, and Ozone on the 9th, and at Lead Hill 30th. The snow was light, and melted as it fell.—Prof. John C. Branner, Little Rock, director; W. U. Simons, Corporal, Signal Corps, assistant.

### ILLINOIS.

This has been one of the finest and most favorable Novembers experienced in this state for many years. Take it all through the weather has been exceptionally fine, with light frosts, few rainy days, and very equable temperature. The rainfall has been sufficient, but as it came during a few days in the early part of the month, farming operations were in no wise interrupted.

The temperature was above the average while the extremes were less than usual; no very high or low temperatures being reached. The highest temperature was on the 1st and 2d, and the lowest on the 20th and 21st. There were numerous frosts, but none very severe. About an inch of snow fell on the 15th and 16th, but it did not remain on the ground.

#### Summary.

*Temperature.*—The mean temperature of the month, 41.5, was 1.2 above that of the previous ten years. The mean of the northern division was 39.2,